A SHORT ACCOUNT OF A COURSE OF Natural & Experimental PHILOSOPHY.

11175/p

In which will be exhibited
The EXPERIMENTS neceſſary for the
EXPLANATION of

NATURAL PHILOSOPHY in general, or the Properties of Matter, and the Laws by which it acts.
MECHANICS.
ASTRONOMY, or the Phænomena ariſing from the Motion of the Heavenly Bodies.
GEOGRAPHY, and the Uſe of the Globes, &c.
HYDROSTATICS, or the Nature and Laws of *Fluids* explain'd.
PNEUMATICS, explaining the ſurprizing Properties of the *Air*, which depend upon its Preſſure and Elaſticity, its Rarefaction, Condenſation, &c.
OPTICS, or the Science of Viſion.

By *J. ARDEN*,
Teacher of Experimental Philoſophy *at BEVERLY.*

The Charge of going through this COURSE is *one Guinea*, to be paid at the Time of ſubſcribing, or at the firſt LECTURE, and to begin as ſoon as thirty or more have ſubſcribed.

N. B. Thoſe Perſons whoſe Buſineſs will not permit them to attend the Whole, may be admitted to any ſingle *Lecture* for *Two Shillings.*

T*HE Advantages which have accrued to the World from* Experimental Philoſophy, *appear in the frequent Improvements now made in all thoſe Things which ſupply the Neceſſities or ſerve the Intereſts of Mankind. It's Uſes are ſo extenſive that there is not a ſingle Art or Science to the Advantage of which it may not be applied. —— A ſtrict Inſpection, therefore, into the grand Diſcoveries founded thereon, which are of ſo great Conſequence to Society, is ſufficient to induce us to eſteem it as the moſt effectual Means ſpeedily to improve all Arts and Sciences, to diſcover Cauſes from their Effects, and to make Art and Nature conſpire in Subſerviency to the Neceſſities and Ornaments of Life; which may be better underſtood by ſeeing the Experiments performed, than by a long and tedious Application to* Books *only.*

The greateſt Care will be taken (through this COURSE*) to render the Experiments as plain and intelligible as poſſible, even to thoſe who have not applied any Time or Study this Way.*

At BEVERLY, *are read by* J. ARDEN, Compleat Courſes of Lectures *on the ſeveral Branches, of* Natural *and* Experimental Philoſophy, *viz.*

CHEMISTRY, MECHANICS, HYDROSTATICS, HYDRAULICS, PNEUMATICS, OPTICS, ASTRONOMY, and the Uſe of the GLOBES.

The Apparatus with which the Experimental Part of theſe Lectures will be conducted is *extenſive,* and elegantly finiſhed with the *lateſt Improvements.*

At theſe Lectures, all young Gentlemen educated under the Rev. Mr. *Ward,* may attend in Conſequence of Terms already agreed upon for that Purpoſe.

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The Public may be aſſur'd that the utmoſt Care will be taken by the ſeveral Maſters to qualify Youth for the Univerſity, the Army, Navy, the Attorney's Office, or the Counting-Houſe, upon the moſt reaſonable Terms.

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LECTURE the Firſt. Augt. 6th

OF the Riſe, Progreſs, and Uſefulneſs of EXPERIMENTAL PHILOSOPHY.

Of Matter; its { Extenſion. Solidity. Diviſibility, &c.

Of Space, a Vacuum, and the Poroſity of Bodies.

Attraction, what?

It's Kinds; viz. of { Cohæſion. Gravitation. Magnetiſm. Electricity.

Attraction of Cohæſion; what?

It's Univerſality between Particles of the { Same or Different, { Fluids or Solids,

Or between certain Fluids and Solids.

It's various Degrees in different Bodies.

It's Laws deduced from the Aſcent of Fluids { In ſmall Tubes / Between Glaſs Planes.

The Height of the Aſcent of Fluids in Glaſs Tubes in a reciprocal Proportion to the Diameters of the Tubes.

The Hyperbolic Curve illuſtrated.

The Power of Attraction of Cohæſion { ſhewn by Experiments with Lead, Copper, &c. / does not act at the Point of Contact only, but at ſome perceptible Diſtance.

LECTURE the Second. Augt. 7th

OF REPULSION.

Where the Sphere of Attraction ceaſes, that of Repulſion begins.

This active Principle prov'd by Experiments.

Concretion, Diſſolution, and other Operations in Chymiſtry, explain'd upon the Principles of Attraction and Repulſion.

How Variety of Colours may be { Produc'd? Deſtroy'd? Reſtor'd? }

How Stains in Silk may be taken out, and their proper Colours reſtor'd.

Why ſome Bodies are fluid, and others ſolid.

Surpriſing Experiments with Glaſs Bubbles.

LECTURE the Third. Augt. 8th

ON ELECTRICITY.

The Term explain'd.

Not a new Diſcovery, but known to the Antients.

Bodies electric *per Se*, and non electric, What?

Electrical Attraction and Repulſion ſhewn.

Their Laws of Action; What?

Not in Proportion to the Surfaces, or to the Quantity of Matter in Bodies, but to their Figures.

Conductors of Electricity, What?

Of the Nature of the Electric Spark.

How and whence produc'd? { From the Earth by Machines.
{ From the Clouds by the Electric Kite.

The Matter of Electricity and Lightning the ſame. Hence,
Some uſeful Concluſions.
Thunder and Lightning accounted for.
The Method of calculating their Diſtance from us.
The Effects of the Electric Effluvia upon Matter in general.
Particularly upon Fluids. Hence,
Their Effects upon the Human Body in the Cure of ſeveral Diſorders, attempted to be explain'd.
The Muſſchenbroek Shock.

LECTURE the Fourth. Aug. 10th.

A Perſon Electrified.
Several Bodies, ſuch as,
Oil of Turpentine,
Spirits of Wine,
Inflammable Air,
or Gunpowder,
} Set on Fire by the Electric Spark.
The Muſſchenbroek Shock further conſidered and explain'd.
Leaf Gold fuſ'd.
Fire in all Bodies.
Phoſphori and other Bodies producing Fire by Friction in the Camera Obſcura.
The Whole experimentally illuſtrated by new invented portable Machines.

LECTURE the Fifth. Aug. 12th.

ATTRACTION of Gravitation, What?
The Proportion of it's Decreaſe, What?
Of Motion, its various Kinds and Affections.
Newtonian Laws of Motion, What?
Momentum, What? How eſtimated?
The Centers of { Motion. Magnitude, Gravity, } defin'd.

[illegible]

The Center of Gravity, how found? and diſtinguiſhed from the Centers of Motion and Magnitude.
A heavy Body prevented from falling by adding a heavier to it.
Why Towers and other Buildings much inclin'd, do not fall?
The ſeeming Aſcent of the double Cone, and Cylinder explain'd.
Why ſome heavy Bodies ſlide, others roll, and others fall, when plac'd upon an inclin'd Plane.
The General Principles of Mechanics——Applied.

To the ſeveral Mechanical Powers, *viz.* the {
- Lever, { Simple. Compound.
- Ballance,
- Pullies, { Single. Combin'd.
- Inclin'd Plane.
- Screw.
- Wedge.
- Wheel and Axle.

[illegible]

LECTURE the Sixth. Augt. 13th

EXperiments relating to Friction. [illegible]

The Abſurdity of the common Method of loading Wheel Carriages, demonſtrated by Experiments, and a better pointed out.

The Advantages, and Diſadvantages, attending the Uſe of Broad-Wheel'd Carriages, demonſtrated by Experiments. [illegible]

How unequal Powers may act in Proportion to their Strength.

LECTURE the Seventh. Augt. 14

OF the Magnet:——It's Properties, by whom, and when firſt applied to the Purpoſes of Navigation.

Of the Mariner's Needle:——It's Uſe in Navigation.

Magnetic Attraction and Repulſion ſhewn.

The Power of the Magnet,
- how communicated to Iron.
- how deſtroy'd.
- acts through the denſeſt Bodies.

Its Polarity;
- what?
- how given?
- how chang'd?

Magnets artificial, how made?

The Courſe of the Magnetic Effluvia illuſtrated by ſeveral curious Experiments. Hence. [illegible]

How the Virtues of Magnets may be preſerv'd. [illegible]

Compound Artificial Magnets to lift great Weights, how made?

LECTURE the Eighth. Augt. 15th

THE Globes deſcrib'd, and their Uſe taught.

Central Forces explain'd, and illuſtrated by various Experiments. [illegible]

LECTURE the Ninth.

Augt. 17th

OF ASTRONOMY in general.

Of the Sun:—His
- Situation,
- Magnitude,
- Revolution round his own Axis,
- Spots.

Of the Planets; their
- Order.
- Magnitude.
- Diſtance,
  - from the Sun.
  - from each other.
- Orbits, and how retain'd in them.
- Periodical Times.
- Satellites.

Of the Earth in particular;
- It's Figure,
- It's Revolution
  - round the Sun.
  - upon it's own Axis.

The apparent Motion of the Sun
The Difference of Seaſons,
The Inequality of Days and Nights,
to what owing?

Of the Moon, her Revolutions, different Appearances, &c.

Of Eclipſes, particularly of the Sun and Moon.

LECTURE the Tenth. Augt. 19th

ON HYDROSTATICS, and their Uſe.

Fluidity, to what owing?

That Fluids
- gravitate in proprio Loco.
- preſs in all Directions.

Fluids conſider'd as divided,
- by imaginary Surfaces.
- into perpendicular Columns.

That Bodies	heavier	than Water or Quickſilver	may be made to ſwim in	Water, or Quickſilver.
	lighter		may be depreſs'd & kept down by	

Water incompreſſible, prov'd by the Florentine Experiment.

That the Preſſure of a Fluid upon the Baſe of a Veſſel, will always be in Proportion to that Baſe, and the perpendicular Height of the Fluid, whatever be the Quantity of Fluid, or Figure of the containing Veſſel. Hence.

The Hydroſtatic Paradox prov'd, *viz.* That a Pint of Water may counterballance ſeveral Thouſand Gallons.

LECTURE the Eleventh. Augt 20th

THAT Bodies heavier than Water when weigh'd in it, loſe as much of their own Weight, as is equal to the Weight of a Quantity of Water of their own Bulk.

That Bodies lighter than Water will ſo ſwim in it, that a Quantity of Water equal to the Part immers'd, will be equal in Weight to the whole Body.

Specific Gravity of Bodies; what?

How determin'd? [illegible]

Of the Hydroſtatic Ballance?

It's Uſe, particularly in diſcovering the Alloy of Metals, and conſequently the Goodneſs of Money.

Specific Gravity of Timber; how found?

Of Hydrometers. Their Uſe in determining the Denſity of Fluids, and hence in diſcovering the Strength of Spirituous Liquors.

Fawkes's Figures ſhewn, and the Principle on which they act, explain'd.

LECTURE the Twelfth. Augt 21st

OF the AIR in general.

That the Air is
- A Body.
- capable of raiſing and ſupporting great Weights.
- Elaſtic.

Of the Atmoſphere, and the Aſcent of Vapours.

Vapours,
- how produc'd?
- how ſupported?

Miſts, Rain, Hail, Snow, and the Halo explain'd.

That the Denſity and Spring, or Elaſticity of the Air, is always in Proportion to the compreſſing Force. Hence.

That its Denſity and Preſſure decreaſe in Proportion to its Diſtance from the Surface of the Earth.

The Smoke, or more properly, the Air-Jack, explain'd by a Model.

Clouds at different Heights, ſometimes move in oppoſite Directions; why?

Air, its Weight, Specific Gravity, Preſſure, prov'd.

The Aſcent of Fluids in Capillary Tubes, the ſame in Vacuo, as in the open Air.

LECTURE the Thirteenth. Augt 22d

THE Weight and Spring of the Air directly prov'd by
- Marble Plains dropping aſunder in Vacuo.
- Burſting Bladders.
- Glaſs Bubbles.
- Breaking Glaſs Vials internally and externally.
- Jets of Water and Quickſilver.
- The famous Experiment with the Braſs Hemiſpheres.

The Air's Preſſure upon our Bodies calculated.

Suction, no occult Quality. How explain'd? Owing to an Inequality of Preſſure.

Hiero's Fountain explain'd by a Model.

LECTURE the Fourteenth.

Augt. 24

SOME remarkable Effects and Uſes of the Spring and Preſſure of the Air upon Animal and other Bodies.

Reſpiration how perform'd? This Illuſtrated.

The Effects of rarified Air upon the Life of Animals and upon Flame.

Air how { vitiated, purified, } Hence the Nature and Cure of Damps in Mines.

The Effects of vitiated Air upon the Life of Animals and upon Flame.

Air how medicated and inſpir'd?

A new-invented Machine for this Purpoſe.

Its Uſe in curing and preventing many Diſorders.

Flame deſtroys the vivifying Spirit of the Air.

The Uſe of Air in { Fiſhes, Eggs, } What?

The true Reaſon why drown'd Bodies float, aſſign'd and prov'd by Experiment.

A Method of diſcovering whether Infants were born dead or alive.

Method of Cupping, ſhewn and explain'd.

LECTURE the Fifteenth.

Augt. 26th

ON BAROMETERS.

The Aſcent of the Mercury in them. To what owing?

The Preſſure of the Air upon the ſtagnant Mercury.

This prov'd by various Experiments; particularly that of Monſ. *Azout*.

The Mercury ſupported equally high by the bare Spring of a little included Air.

Beſt Method of conſtructing }
Rules for knowing good } Barometers.
The Uſe of }

Heights of Mountains, }
Depths of Mines, } how meaſur'd by the Barometer?

Of Pumps —The Several Sorts and Conſtruction of 'em illuſtrated by Glaſs Models, and the Principles, upon which they act, explain'd.

Suction (commonly ſo called) further illuſtrated.

Of Syphons; Tantalus's Cup. Hence, ſome ſtrange Appearances in Nature accounted for.

LECTURE the Sixteenth.

Augt. 2

THE Art of Diving illuſtrated by a Model of the Diving-Bell, with Dr. *Halley*'s Improvements.

The Magazine Wind Gun ſhewn, and its Structure explain'd.

Thermometers and Hygrometers their { various Conſtruction. Uſe. Inaccuracies. }

Expanſion of Metalls by Heat prov'd, and render'd ſenſible to the 130,000th Part of an Inch.

All Bodies fall equally faſt in Vacuo.

LECTURE the Seventeenth. Aug. 28

SOUND, Whence?
How propagated?
Cannot be produc'd in Vacuo.

Perſons born deaf, how made to hear?
No Exploſion from Gunpowder fir'd in Vacuo.
Exploſion of Fire-Arms; whence?

Vegetation,
Growth of Plants,
Maturation of Fruits, illuſtrated by Experiments.

Quantity of Air in Water,
Raw Fleſh,
Malt Liquor,
Fruits, ſhewn.

Air Pump; its Conſtruction,
Manner of working, explain'd.

Projectiles, and the Art of Gunnery, illuſtrated by Experiments.

LECTURE the Eighteenth. Aug. 29

OF Light; its Materiality,
Fluidity,
Velocity, prov'd.
Reflection,
Refraction, What? Their Laws explain'd, and experimentally illuſtrated.

The Effects produc'd by plane,
convex,
concave, Mirrours explain'd.

The Eye diſſected; its Coats,
Humours, Their Number,
Uſe, explain'd.

The Retina; What?
The Seat of Viſion; Where? O. P. givs
Defects of Sight, how aſſiſted by Glaſſes?

LECTURE the Nineteenth. Aug. 31

THE Effects produc'd by Lenſes Plano-Convex,
Double-Convex,
Plano-Concave,
Double-Concave,
Meniſcus, or Concavo-Convex explain'd.

Of Microſcopes, Single,
Compound,
Solar, Their various Structure,
Uſe, explain'd

Of Teleſcopes, Dioptric,
Catoptric, Their Uſe,
Structure, explain'd.

LECTURE the Twentieth. Aug. 19

THE firſt convenient Day the Sun ſhines clear, will be ſhown various Experiments,

With the Solar Microſcope,
Priſm,
Camera Obſcura.

FINIS.